

917 1. ~~A drill string drive comprising:~~  
2 a motor adapted to rotate a drill string;  
3 a sensor adapted to detect the rotation of said  
4 drill string; and  
5 a computer receiving rotational information from  
6 said sensor, said computer transmitting control  
7 signals to said motor, said computer programmed  
8 to control said motor to advance said drill  
9 string to a predetermined angle.

1 2. A drill string drive comprising:  
2 a motor adapted to rotate a drill string;  
3 a sensor adapted to detect the rotation of said  
4 drill string; and  
5 a computer receiving rotational data from said  
6 sensor and transmitting control signals to said  
7 motor, said computer programmed to control the  
8 rotation of said motor, said computer advancing  
9 said drill string a predetermined angle in a  
10 first direction and then reversing said  
11 rotation and advancing said drill string a  
12 predetermined angle in a second direction.

3. A drilling system comprising:

a motor;

a drill string connected to said motor;

a first sensor adapted to detect the rotation of

said motor;

a bit at the distal end of said drill string;

a second sensor adapted to detect the orientation of  
said bit;

a computer adapted to receive information from said  
first sensor and said second sensor.

4. A drill string drive comprising:

a hydraulic motor adapted to rotate a drill string,  
said hydraulic motor having a fluid supply  
system;

an operating valve located in said fluid supply  
system, said operating valve causing fluid to  
rotate said hydraulic motor in a first  
direction when open; and

a counterbalance valve located in said fluid supply  
system, said counterbalance valve causing said  
hydraulic motor to resist external rotational  
forces in said first direction when said  
operating valve is closed.

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5. A drilling method comprising:  
monitoring the rotation of a drill string with a  
sensor;  
transmitting said rotational information to a  
computer;  
controlling a motor that rotates said drill string  
with said computer; and  
rotating said drill string to a predetermined angle.

6. A drilling method comprising:  
monitoring the rotation of a drill string with a  
sensor;  
transmitting said rotational information to a  
computer;  
controlling a motor that rotates said drill string  
with said computer; and  
oscillating said drill string between predetermined  
angles.

08877738-064797

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May 7.

A directional drilling method comprising:  
monitoring the rotation of a drill string with a  
first sensor;  
monitoring the orientation of a downhole tool with a  
second sensor, said downhole tool being  
connected to the end of said drill string;  
transmitting said drill string rotational  
information to a computer;  
transmitting said downhole tool orientation  
information to said computer;  
controlling a motor that rotates said drill string  
with said computer; and  
rotating said drill string with said computer  
controlled motor to a predetermined angle such  
that said downhole tool is rotated to a  
predetermined orientation.

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